Geographically Targeted Information Dissemination Services (GeoTIDeS)
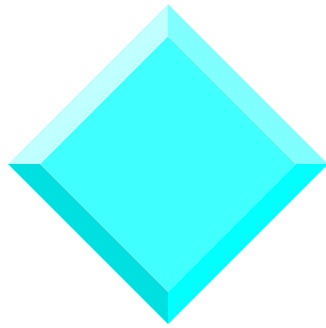
2nd I-CNS Conference and Workshop
May 1, 2002

Kevin Millikin
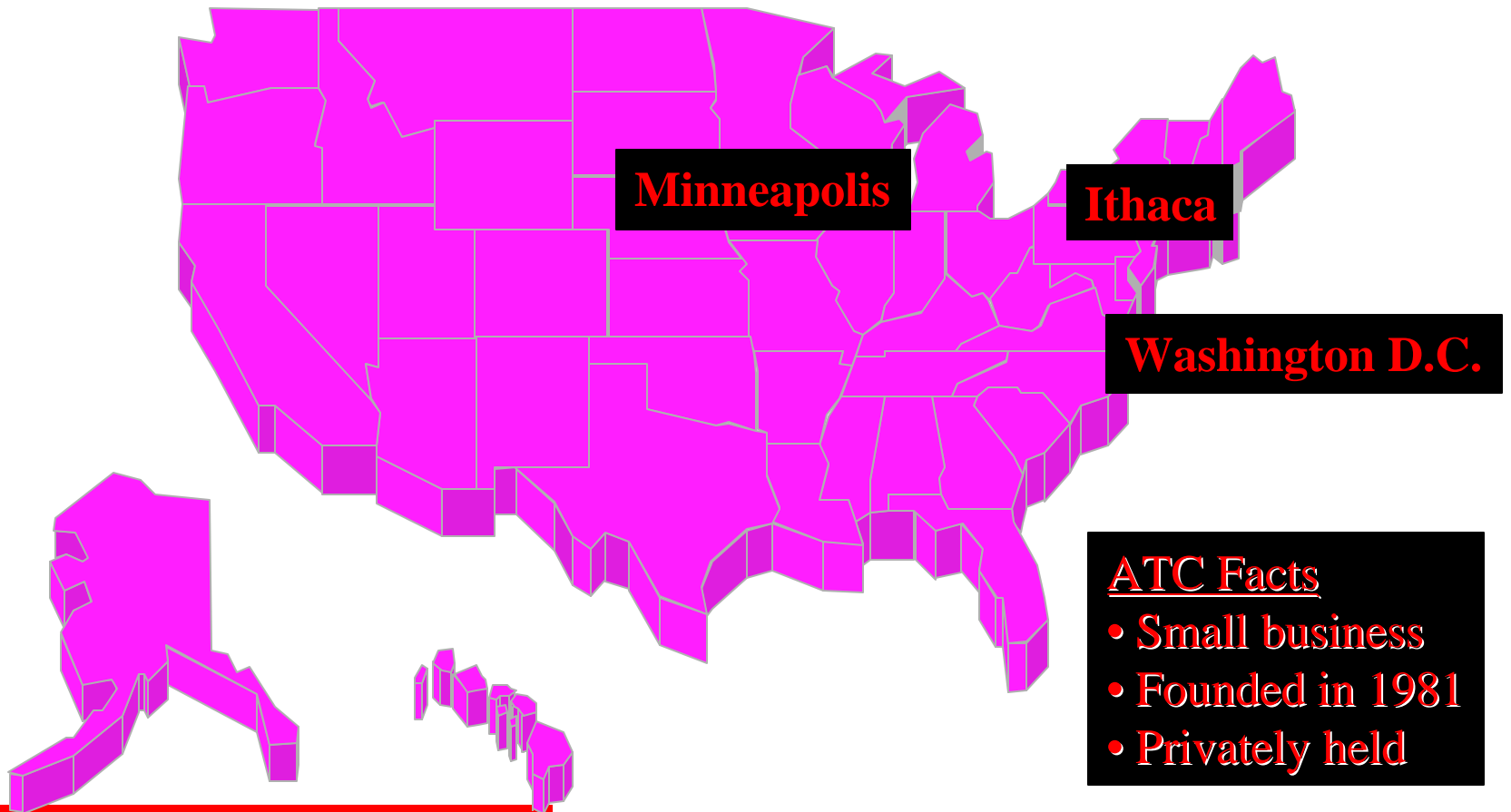**Research Scientist**

Architecture Technology Corporation
Eden Prairie, Minnesota
(952) 829-5864

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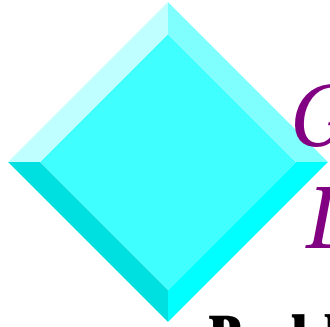
ATC Operations

Minneapolis

Ithaca

Washington D.C.

ATC Facts
- Small business
- Founded in 1981
- Privately held

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Geographically Targeted Information Dissemination Services (GeoTIDeS)

- **Problem Statement:** Transmit information to mobile network nodes based on their geographic position. <u>Senders</u> desire information to flow to only those nodes within a given geographic region. <u>Receivers</u> desire to receive only information relevant to their current position.
  - Runs on top of IP, suitable for any link layer technology that supports IP
  - Position information can be derived from GPS receivers carried by the mobile nodes or by radar or satellite surveillance data
  - GeoTIDeS middleware mediates between applications and network
 - API enables rapid and low-cost third party development of location aware services

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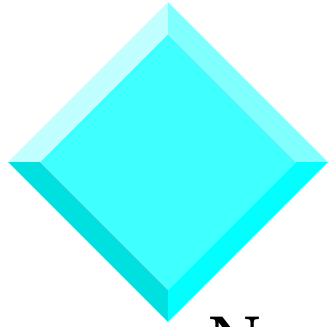
Outline

- New communication primitives:
  - Geocasting
  - Range-restricted Information Dissemination
  - Banner in the Sky
- Possible Applications
- Architecture Overview
- Summary

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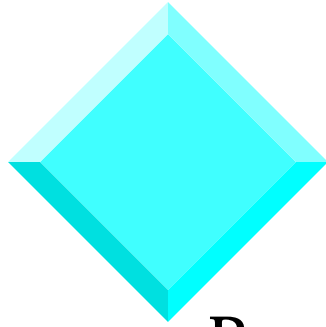
A New Communication Primitive: Geocasting

- Provides a publish/subscribe capability similar to IP multicasting

- Senders send messages to geographic regions
  - basic regions are rectangles, cylinders, and spheres
  - API allows more complicated regions to be constructed by composition or deletion

- Receivers receive messages addressed to any region that contains their geographic coordinates

- Geographic regions are analogous to multicast addresses, receivers implicitly subscribe by entering a region and unsubscribe by leaving it
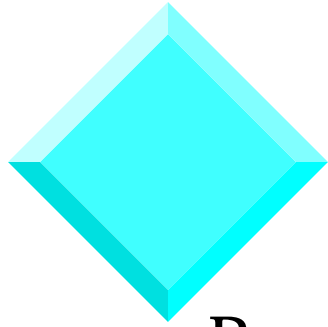
Geocasting Continued

- Receivers receive on their "current location"; which is dynamic, changing as the receiver moves

- Region membership changes due to receivers moving into or out of the region

- GeoTIDeS ensures that messages are efficiently routed to only those receivers in the region of interest

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Range-restricted Information Dissemination

- Senders send messages to all receivers within a given range of the sender's position
- Similar to geocasting, save the sender may be a mobile device itself
- The boundaries of the region are dynamic, changing with the motion of the sender
- Region membership changes both due to receivers moving into or out of the region, and regions moving "over" receivers
- GeoTIDeS ensures that messages are routed to only those receivers in the region of interest

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Banner in the Sky: "Pinned" Messages

- Senders can associate a static message with a region
- Mobile receivers entering the banner region receive the message on entering the region
- Again similar to geocasting, save message is static and triggered by receiver entering region
- GeoTIDeS ensures receivers receive the message when entering the banner region
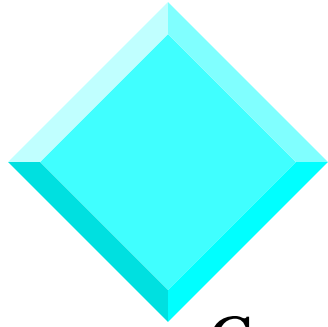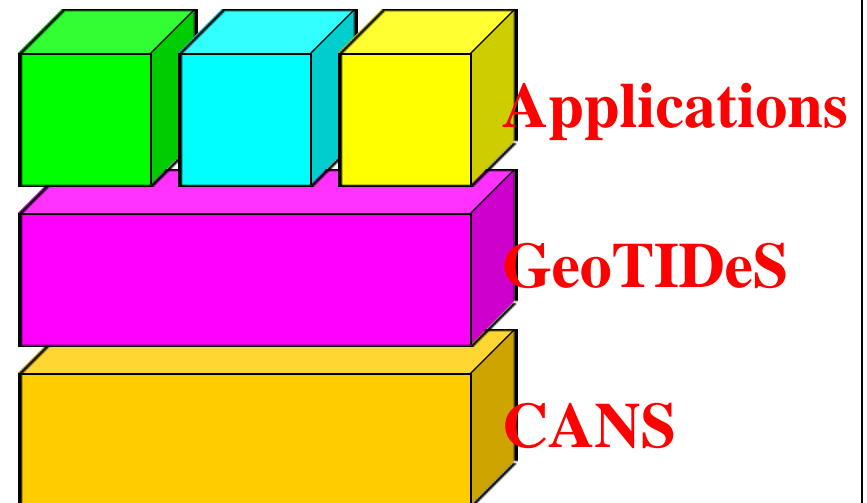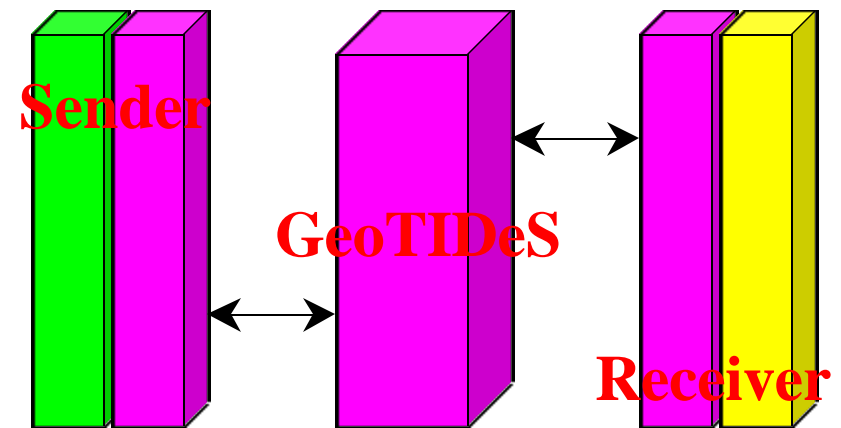
Possible Applications

- Geocasting
  - weather alerts, NOTAMS
- Range-restricted Information Dissemination
  - route intentions, experienced conditions
- Banner in the Sky
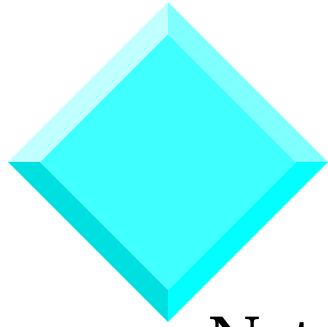 - airspace fence, temporarily restricted airspace, airport situational information

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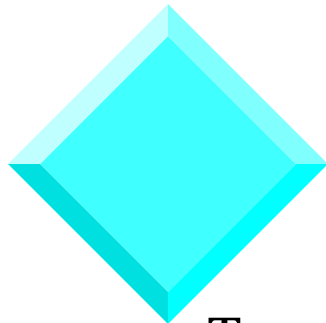
Architecture Overview

- Two suboptimal approaches: sender is completely responsible, receiver is completely responsible

- GeoTIDeS employs a hybrid approach, splitting communication responsibility between the senders, receivers, and the network itself

- GeoTIDeS uses ATC's Smart Active Networks developed for ONR

Sender

GeoTIDeS

Receiver

Applications

GeoTIDeS

CANS

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GeoTIDeS Components

- ## Network resident **GeoTIDeS Servers**
  - may be distributed for fault-tolerance or performance/scalability
  - route messages through IP network to destination nodes
  - current implementation runs on Java platform
- ## **GHost** API
  - runs on wired/wireless mobile/stationary client
  - provides interface to geocast, range-restricted and banner capabilities
  - current implementation targeted for Windows (98/NT/2000/XP)
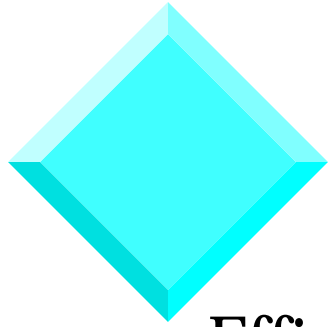
GeoTIDeS is...

- Efficient
- Scalable
- Secure
- Anonymous

Thank you. Questions?